REMARKS

The Office Action mailed December 10, 2004, has been received and reviewed. Claims 1 through 28, and 100 through 129 are currently pending in the application. Claims 1-15, 100 and 102-115 stand rejected. Claims 16 through 28, 101, and 116 through 129 are allowed. Applicant has amended claims 4 and 104. Claims 5, 6 105 and 106 are canceled without prejudice or disclaimer. Reconsideration is respectfully requested.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 6,074,943 to Brennan et al. in view of U.S. Patent No. 6,436,816 to Lee et al.

Claims 1, 4 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennan et al. (U.S. Patent No. 6,074,943) in view of Lee et al. (U.S. Patent No. 6,436,816). Applicant respectfully traverses this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

Brennan teaches or suggests a prior art method of forming via structures including thick buffer regions on the sidewalls of interconnects. (Brennan, FIG. 3). Lee discloses a method of electroless plating. The method includes electrolessly depositing a metal layer 140 (copper or nickel) on adhesion (seed) layer 130 polysilicon, aluminum or titanium) overlying a barrier layer 120 (TiW, MoN, WN, TiN and TaN) to form a metal line. The barrier layer is selected to overcome particular problems associated with electroless plating. (Lee, col. 4, lines 1-25). The composition of the adhesion layer is a key unique feature of the invention. (Lee, col. 12, lines 9-12).

By way of contrast with Brennan and Lee, claim 1 of the presently claimed invention recites a "metallization structure for a semiconductor device, comprising: a substrate comprising a substantially planar upper surface; and a conductive line for transmitting a signal laterally across the substrate, the conductive line consisting essentially of: a metal layer defining a pattern on a portion of the substrate upper surface; a single conducting layer overlying and substantially coextensive with the metal layer, the metal layer and the single conducting layer having substantially aligned sidewalls and the single conducting layer defining an upper surface of the conductive line; and metal spacers flanking and extending at least substantially to a height of the sidewalls of the single conducting layer and metal layer". Applicant respectfully asserts that the proposed combination of references fail to teach or suggest all the claim limitations of claim 1 of the presently-claimed invention to establish a *prima facie* case of obviousness under 35 U.S.C. § 103.

Applicant respectfully asserts that the proposed combination fails to teach or suggest the claim limitation calling for a conductive line for transmitting a signal laterally across the substrate consisting essentially of a metal layer, a single conducting layer and metal spacers as recited in claim 1 of the presently claimed invention or a metal layer defining a pattern on a portion of the substrate upper surface. Brennan fails to teach or suggest a metal layer defining a pattern on a substrate upper surface and only incidentally suggests spacers as etch stop buffer regions. The examiner states that Lee discloses a barrier metal layer 120 and copper layer 140. (Office Action, page 2). Lee discloses adhesion layer 130 between metal layer 120 and copper layer 140. However, claim 1 recites (in part) a conductive line consisting essentially of a "metal layer defining a pattern on a portion of the substrate upper surface" and "a single conducting layer overlying and substantially coextensive with the metal layer." No motivation exists to exclude the adhesion layer 130 as Lee teaches the benefit of the adhesion layer 130. (Lee, col. 12, lines 9-12). Thus, applicant respectfully asserts that the proposed combination of references fail to teach or suggest all the claim limitations of claim 1 of the presently claimed invention to establish a prima *face* case of obviousness under 35 U.S.C. § 103. Accordingly, claim 1 is allowable.

Claims 4 and 7 are each allowable as depending, either directly or indirectly, from allowable claim 1.

Obviousness Rejection Based on U.S. Patent No. 6,074,943 to Brennan et al. in view of U.S. Patent No. 6,436,816 to Lee et al. as applied to claims 1, 4 and 7 above, and further in view of U.S. Patent No. 6,281,115 to Chang et al.

Claims 2, 3, 100, 102 through 104 and 107 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennan et al. (U.S. Patent No. 6,074,943) in view of Lee et al. (U.S. Patent No. 6,436,816) as applied to claims 1, 4 and 7 above, and further in view of Chang et al. (U.S. Patent No. 6,281,115). Applicant respectfully traverses this rejection, as hereinafter set forth.

The discussion of Brennan and Lee above are incorporated herein. Chang discloses a structure including a substrate 1 having an insulating layer 2 thereon. Interconnect metal structures 3 are located on the insulated layer 2 and enveloped by low dielectric constant layer 4a. An aperture 5 in low dielectric constant layer 4a is lined with insulator layer 6a. (Chang, Fig. 3, Fig. 7) 18 includes an aperture having spacers 22a that extend partially up the sidewalls of the aperture. The spacers 22a are in contact with a dielectric layer 22 and form a trench 14 within the aperture. The trench 14 also only partially fills with aperture and is filled with conductive material 24. First insulating layer 18 is in contact with conductive layer 24 which underlies a second insulating layer 26 and interconnect layer 28. The interconnect layer 28 also extends into the first insulating layer 18. (Chang, Fig. 6). Chang clearly fails to cure the deficiencies of Brennan in view of Lee.

With respect to dependent claims 2, 3 and 100, the Court of Appeals for the Federal Circuit has stated that "dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP § 2143.03. Having failed to teach or suggest each and every limitation of the independent claims, the prior art referenced as rendering dependent claims 2, 3 and 100 obvious, cannot serve as a basis for rejection.

Claim 102 of the presently claimed invention is allowable for at least the same reasons as set forth with respect to claim 1. The proposed combination of references fails to teach or suggest a "structure for transmitting a signal across a semiconductor device, the structure comprising: a substrate comprising a substantially planar upper surface; and a conductive line

extending over the upper surface and isolated therefrom by a dielectric layer at least underlying the conductive line, the conductive line consisting essentially of: a metal layer above the dielectric layer, the metal layer defining a pattern on a portion of the substrate upper surface; a single conducting layer overlying and substantially coextensive with the metal layer, the metal layer and the single conducting layer having substantially aligned sidewalls, wherein an upper surface of the single conductive layer defines an upper surface of the conductive line; and metal spacers flanking and extending at least substantially to a height of the sidewalls of the single conducting layer and metal layer" as recited in independent claim 102 of the presently claimed invention.

Applicant respectfully asserts that the proposed combination fails to teach or suggest the claim limitation calling for a conductive line consisting essentially of a metal layer above the dielectric layer, the metal layer defining a pattern on a portion of the substrate upper surface; a single conducting layer overlying and substantially coextensive with the metal layer, the metal layer and the single conducting layer having substantially aligned sidewalls, wherein an upper surface of the single conductive layer defines an upper surface of the conductive line; and metal spacers flanking and extending at least substantially to a height of the sidewalls of the single conducting layer and metal layer as recited in claim 102 of the presently claimed invention. Brennan fails to teach or suggest a metal layer defining a pattern on a substrate upper surface and only incidentally suggests spacers as etch stop buffer regions. The examiner states that Lee discloses a barrier metal layer 120 and copper layer 140. (Office Action, page 2). Lee discloses adhesion layer 130 between metal layer 120 and copper layer 140. However, claim 1 recites (in part) a conductive line consisting essentially of a "metal layer defining a pattern on a portion of the substrate upper surface" and "a single conducting layer overlying and substantially coextensive with the metal layer." No motivation exists to exclude the adhesion layer 130 as Lee teaches the benefit of the adhesion layer 130. (Lee, col. 12, lines 9-12). Chang does not overcome the deficiencies of Brennan and Lee. Thus, applicant respectfully asserts that the proposed combination of references fail to teach or suggest all the claim limitations of claim 1 of the presently claimed invention to establish a prima *face* case of obviousness under 35 U.S.C. § 103. Accordingly, claim 102 is allowable.

Claims 103 through 113 and 115 are each allowable as depending, either directly or indirectly, from allowable claim 102..

Obviousness Rejection Based on U.S. Patent No. 6,074,943 to Brennan et al. in view of U.S. Patent No. 6,436,816 to Lee et al. as applied to claims 1, 4 and 7 above, and further in view of U.S. Patent No. 6,277,745 to Liu et al.

Claims 5, 6, 10, 11 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennan et al. (U.S. Patent No. 6,074,943) in view of Lee et al. (U.S. Patent No. 6,436,816) as applied to claims 1, 4 and 7 above, and further in view of Liu et al. (U.S. Patent No. 6,277,745). Applicant respectfully traverses this rejection, as hereinafter set forth. Claims 5 and 6 have been canceled, thus the rejection of these claims is moot.

The discussion of Brennan and Lee above is incorporated herein. Liu teaches or suggests a passivation method of post copper dry etching. Liu teaches or suggests a sandwich structure consisting of a bottom barrier layer 4, a copper layer 6 and a top barrier metal layer 8. After formation of this sandwich structure and patterning, the exposed sidewalls are passivated by means of a barrier metal spacer process. Liu teaches that the fully encapsulated copper lines are highly resistant to oxidation which is an otherwise inherent problem with bare copper lines. (Liu, Abstract) Liu fails to correct the deficiencies of Brennan in view of Lee.

The Court of Appeals for the Federal Circuit has stated that "dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP § 2143.03. Having failed to teach or suggest each and every limitation of the independent claims, the prior art referenced as rendering dependent claims 10, 11 and 15 obvious, cannot serve as a basis for rejection.

Obviousness Rejection Based on U.S. Patent No. 6,074,943 to Brennan et al. in view of U.S. Patent No. 6,436,816 to Lee et al. as applied to claims 1, 4 and 7 above, and further in view of U.S. Patent No. 6,285,082 to Joshi et al.

Claims 8 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennan et al. (U.S. Patent No. 6,074,943) in view of Lee et al. (U.S. Patent No. 6,436,816) as

applied to claims 1, 4 and 7 above, and further in view of Joshi et al. (U.S. Patent No. 6,285,082). Applicant respectfully traverses this rejection, as hereinafter set forth.

The Court of Appeals for the Federal Circuit has stated that "dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP § 2143.03. Having failed to teach or suggest each and every limitation of the independent claims, the prior art referenced as rendering dependent claims 8 and 9 obvious, cannot serve as a basis for rejection.

Obviousness Rejection Based on U.S. Patent No. 6,074,943 to Brennan et al. in view of U.S. Patent No. 6,436,816 to Lee et al. as applied to claims 1, 4 and 7 above, and further in view of U.S. Patent No. 6,677,647 to Dawson

Claim 12 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennan et al. (U.S. Patent No. 6,074,943) in view of Lee et al. (U.S. Patent No. 6,436,816) as applied to claims 1, 4 and 7 above, and further in view of Dawson (U.S. Patent No. 6,677,647). Applicant respectfully traverses this rejection, as hereinafter set forth.

The Court of Appeals for the Federal Circuit has stated that "dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP § 2143.03. Having failed to teach or suggest each and every limitation of the independent claims, the prior art referenced as rendering dependent claim 12 obvious, cannot serve as a basis for rejection.

Obviousness Rejection Based on U.S. Patent No. 6,074,943 to Brennan et al. in view of U.S. Patent No. 6,436,816 to Lee et al. in view of U.S. Patent No. 6,677,647 to Dawson as applied to claim 12 above, and further in view of U.S. Patent No. 6,046,502 to Matsuno

Claims 13 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennan et al. (U.S. Patent No. 6,074,943) in view of Lee et al. (U.S. Patent No. 6,436,816) in view of Dawson (U.S. Patent No. 6,677,647) as applied to claim 12 above, and further in view of Matsuno (U.S. Patent No. 6,046,502). Applicant respectfully traverses this rejection, as hereinafter set forth.

The Court of Appeals for the Federal Circuit has stated that "dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP § 2143.03. Having failed to teach or suggest each and every limitation of independent claim 1, the prior art referenced as rendering dependent claims 13 and 14 obvious, cannot serve as a basis for rejection.

Obviousness Rejection Based on U.S. Patent No. 6,074,943 to Brennan et al. in view of U.S. Patent No. 6,436,816 to Lee et al. in view of U.S. Patent No. 6,281,115 to Chang et al. as applied to claims 2, 3, 100, 102-104 and 107 above, and further in view of U.S. Patent No. 6,277,745 to Liu et al.

Claims 105, 106, 110, 111 and 115 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennan et al. (U.S. Patent No. 6,074,943) in view of Lee et al. (U.S. Patent No. 6,436,816) in view of Chang et al. (U.S. Patent No. 6,281,115) as applied to claims 2, 3, 100, 102-104 and 107 above, and further in view of Liu et al. (U.S. Patent No. 6,277,745). Applicant respectfully traverses this rejection, as hereinafter set forth. Claims 105 and 106 are canceled, thus the rejection of these claims is moot.

The Court of Appeals for the Federal Circuit has stated that "dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP § 2143.03. Having failed to teach or suggest each and every limitation of the independent claims, the prior art referenced as rendering dependent claims 110, 111 and 115 obvious, cannot serve as a basis for rejection.

Obviousness Rejection Based on U.S. Patent No. 6,074,943 to Brennan et al. in view of U.S. Patent No. 6,436,816 to Lee et al. in view of U.S. Patent No. 6,281,115 to Chang et al. as applied to claims 2, 3, 100, 102-104 and 107 above, and further in view of U.S. Patent No. 6,285,082 to Joshi et al.

Claims 108 and 109 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennan et al. (U.S. Patent No. 6,074,943) in view of Lee et al. (U.S. Patent No. 6,436,816) in

view of Chang et al. (U.S. Patent No. 6,281,115) as applied to claims 2, 3, 100, 102-104 and 107 above, and further in view of Joshi et al. (U.S. Patent No. 6,285,082). Applicant respectfully traverses this rejection, as hereinafter set forth.

The Court of Appeals for the Federal Circuit has stated that "dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP § 2143.03. Having failed to teach or suggest each and every limitation of the independent claims, the prior art referenced as rendering dependent claims 108 and 109 obvious, cannot serve as a basis for rejection.

~~Obviousness Rejection Based on U.S. Patent No. 6,074,943 to Brennan et al. in view of U.S. Patent No. 6,436,816 to Lee et al. in view of U.S. Patent No. 6,281,115 to Chang et al. as applied to claims 2, 3, 100, 102-104 and 107 above, and further in view of U.S. Patent No. 6,677,647 to Dawson~~

Claim 112 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennan et al. (U.S. Patent No. 6,074,943) in view of Lee et al. (U.S. Patent No. 6,436,816) in view of Chang et al. (U.S. Patent No. 6,281,115) as applied to claims 2, 3, 100, 102-104 and 107 above, and further in view of Dawson (U.S. Patent No. 6,677,647). Applicant respectfully traverses this rejection, as hereinafter set forth.

The Court of Appeals for the Federal Circuit has stated that "dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP § 2143.03. Having failed to teach or suggest each and every limitation of the independent claims, the prior art referenced as rendering dependent claim 112 obvious, cannot serve as a basis for rejection.

Obviousness Rejection Based on U.S. Patent No. 6,074,943 to Brennan et al. in view of U.S. Patent No. 6,436,816 to Lee et al. in view of U.S. Patent No. 6,281,115 to Chang et al. in view of U.S. Patent No. 6,677,647 to Dawson as applied to claim 112 above, and further in view of U.S. Patent No. 6,046,502 to Matsuno

Claims 113 and 114 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over

Brennan et al. (U.S. Patent No. 6,074,943) in view of Lee et al. (U.S. Patent No. 6,436,816) in view of Chang et al. (U.S. Patent No. 6,281,115) in view of Dawson (U.S. Patent No. 6,677,647) as applied to claim 112 above, and further in view of Matsuno (U.S. Patent No. 6,046,502). Applicant respectfully traverses this rejection, as hereinafter set forth.

The Court of Appeals for the Federal Circuit has stated that "dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." In re Fine, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP § 2143.03. Having failed to teach or suggest each and every limitation of the independent claims, the prior art referenced as rendering dependent claims 113 and 114 obvious, cannot serve as a basis for rejection.

ENTRY OF AMENDMENTS

The amendments to claims above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application.

CONCLUSION

Claims 1-4, 7-28, 100-104 and 107-129 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicant's undersigned attorney.

Respectfully submitted,

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